HEALTH RISK BEHAVIORS

MICHIGAN DEPARTMENT OF PUBLIC HEALTH
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HEALTH RISK BEHAVIORS

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Health Surveillance Section
Center for Health Promotion
Michigan Department of Public Health

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Executive Summary

Beginning in 1981, the Centers for Disease Control developed and funded the Behavioral Risk Factor Surveys (BRFS) in 28 states. Michigan participated in the BRFS in 1982 and again in 1987, and published reports presenting risk factor prevalence data. This report describes the methods and findings of the 1988 Michigan BRFS, including prevalence estimates for smoking, lack of seat belt use, alcohol use, obesity, physical inactivity, high blood pressure, and high blood cholesterol for the adult population of Michigan, as well as the distribution of these risk factors among demographic subgroups. The following are highlights of the major findings.

- The prevalence of current **smoking** in Michigan, as measured through the BRFS, has declined from 32.4% in 1982 to 28.9% in 1987; in 1988, the decline continues with 26.7% of the adult population reporting current smoking. This trend is the result of a steady decrease in the number of new smokers combined with an increasing rate of ever-smokers who have quit. The slower rate of decline and/or lower quit rates among women, adolescents, and the less educated indicate the need for targeted smoking prevention and cessation efforts.

- Approximately 58% of the respondents indicate that they always wear a **seat belt** when driving or riding in a car, while almost 20% report "nearly always" wearing a seat belt. Respondents reporting infrequent or no belt use are more likely to be young, male, black, to not have graduated from college, or to have lower household incomes than those who report using seat belts "always" or "nearly always."

- The overall rate for **chronic heavy drinking** for 1988 is 10.5%; the **acute drinking** prevalence for Michigan is 24.3%; and **drinking and driving** is reported by 5.4% of the adult Michigan population. These measures of alcohol use in Michigan are well above comparable national rates. Males are at higher risk for all of these alcohol-related behaviors than are females.

- The prevalence of Michigan adults who are **over the ideal weight** is 23.5% for 1988, including 24.2% of males and 22.8% of females. Neither males nor females in Michigan have yet achieved the Surgeon General's goals for 1990 of reducing the prevalence of obesity to 18% for men and 21% for women. Of those who are identified as overweight, older people, those with fewer years of education, and males appear to be less apt to adopt the Surgeon General's recommended **weight control method** of combining diet and exercise.

- The proportion of Michigan adults reporting participation in **exercise** during the month prior to the survey interview is 72.4%. However, when taking into account the quality and consistency of physical activity patterns, 49% of Michigan adults are identified as "at risk" of developing complications associated with a **sedentary lifestyle**.

- Current **high blood pressure** is reported by 18.2% of Michigan adults. The prevalence of high blood pressure is noted to be higher in blacks and to increase with age.

- The 1988 BRFS data indicate that more than four of every ten (42.1%) Michigan adults have never had a **cholesterol** test. The likelihood of having one's blood cholesterol checked increases with age.

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Introduction

Today, morbidity and mortality due to chronic diseases and injury are of primary concern to public health officials. In 1987, chronic diseases made up seven of the ten leading causes of death in Michigan, with diseases of the heart, malignant neoplasms, and cerebrovascular disease accounting for nearly 70% of all deaths.[1] Accidents were the fourth leading cause of death, while one form of intentional injury, homicide, was the ninth leading cause of death. A similar pattern is reflected in the ten leading causes of death for the United States. (See Table 1.)

Health officials have made the alleviation of chronic disease a top priority.[2] Various studies, such as the Framingham study,[3] the North Karelia Project,[4] the Minnesota Heart Health Program,[5] and the Stanford Three Communities Project,[6] have established the association of behavioral factors with chronic disease morbidity and mortality.[7] Personal health practices and lifestyle choices are recognized to be critical elements in the development of many chronic diseases and in the incidence of injury. Therefore, prevention strategies must focus both on education about healthy habits and on informing the public about how to successfully modify personal behavior which is detrimental to health. This approach differs from traditional public health efforts which were often concerned with responding to emergent crises, such as epidemics of contagious diseases.

The 1979 Surgeon General's Report on Health Promotion and Disease Prevention provided explicit objectives for the prevention of chronic disease, emphasized the importance of lifestyle factors in the etiology of chronic diseases, and recognized the complexity and difficulty of developing and fielding interventions designed to reduce the prevalence of risk behaviors for chronic disease.[2] For example, smoking is a key risk factor for heart disease, malignant neoplasms, and chronic lung disease, while alcohol use

TABLE 1

Leading Causes of Death and Cause-Specific Rates,
Michigan and U.S. Residents, 1987

Rank	Cause of Death	Michigan Rate	U.S. Rate
1	Diseases of the Heart	331.8	313.4
2	Malignant Neoplasms	192.1	196.1
3	Cerebrovascular Diseases	59.6	61.3
4	Accidents	34.2	39.0
5	Chronic Obstructive Pulmonary Disease	31.2	32.2
6	Pneumonia and Influenza	25.8	28.8
7	Diabetes Mellitus	16.1	15.6
8	Atherosclerosis	12.7	9.5
9	Homicide	12.7	8.5
10	Chronic Liver Disease and Cirrhosis	11.9	10.7

Source: Office of the State Registrar, Michigan Department of Public Health
Note: Rates are expressed per 100,000 population.

is a risk factor for unintentional injury, suicide, malignant neoplasms, and chronic liver disease. Assisting large numbers of people to significantly reduce their engagement in these and other risky personal behaviors presents a clear challenge to the health professions.

An important element in planning and evaluating interventions to change high-risk behaviors and practices is the availability of data which document the extent of these behaviors in the population. Surveillance of the prevalence of risk behaviors is an essential initial and periodic activity in the fight to reduce the incidence of chronic diseases and injury.

BACKGROUND

Several federal and state offices have sponsored survey research projects designed to assess the prevalence of high-risk health-related behaviors and practices.

In 1980, the Massachusetts Department of Public Health conducted a telephone survey of 1,091 members of that state's adult population concerning exercise, smoking, obesity, and alcohol use, and reported prevalence rates for these risk factors.[8] Beginning in 1981, the Centers for Disease Control developed and funded the Behavioral Risk Factor Surveys (BRFS) in 28 states, and continues to expand the content and geographic comprehensiveness of this effort.[9,10] Michigan participated in the first wave of BRFS in 1982, and published a report in 1983 presenting data concerning smoking, drinking, hypertension, seat belt use, stress, obesity, and physical activity.[11] A report detailing control of high blood pressure in Michigan, based on a statewide household survey, was published in 1985.[12] Michigan BRFS data gathered in 1987 on smoking, drinking, hypertension, seat belt use, weight and physical activity have also been presented in an annual report.[13]

In 1985, the National Center for Health Statistics added a health promotion/behavioral risk supplement to the National Health Interview Survey, and published national estimates for the above mentioned lifestyle risk factors, as well as for general health status, injury control, dental care, and occupational safety.[14,15]

PURPOSE

This report describes the methods and findings of the 1988 Michigan BRFS. The purpose is to provide risk factor prevalence estimates for smoking, seat belt use, alcohol use, obesity, physical activity, high blood pressure, and high blood cholesterol for the adult population of Michigan, as well as to study the distribution of risk behaviors among demographic subgroups. Our goals are to provide data for assisting in the identification of target groups for health promotion programs, and also to provide some context for interpreting these results, given results of other survey research projects.

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Methods

The 1988 Michigan BRFS was a telephone survey of the adult population 18 years of age and over. Approximately 140 interviews were conducted in June 1988, with about 200 interviews completed for each month from July 1988 to December 1988. Estimates are assumed to apply to the entire calendar year, since the Centers for Disease Control report finding no seasonal variation in BRFS data. Interviewing followed the Centers for Disease Control protocol[1] and was carried out by individuals at the Kercher Center for Social Research at Western Michigan University under contract with the Health Surveillance Section of the Center for Health Promotion. Weighting and statistical analysis of these data were performed within the Health Surveillance Section.

Since over 90% of Michigan households have working telephones, telephone interviewing represents a cost-effective and reasonably valid method for collecting data relative to mail and face-to-face interview approaches.[2-4]

SAMPLING

A sampling methodology by Waksberg was used which involves a three-stage cluster design.[5] In the first stage, eight-digit telephone number prefixes (i.e., an area code, a three-digit prefix, and the first two of the last four numbers) are randomly selected from the state population of eight-digit prefixes. Each of these primary sampling units (PSU) represents one hundred potential phone numbers (i.e., by including the 100 possible last two digits).

In the second stage, complete ten-digit numbers are randomly selected from each PSU. If the first number dialed is a business or non-working number, that PSU is discarded; if the first number is a residential number, the PSU is retained. Because the

probability of reaching a high proportion of working residential numbers within a PSU is inversely related to the existence of non-working or business numbers on the first call, the efficiency of the survey is greatly increased over the random digit dialing method by this elimination of banks of unusable numbers. In the third stage, when a residential number is successfully reached, the household occupants are enumerated and an individual is randomly selected using the Kish respondent selection procedure.[6]

With this method, unlisted and new numbers are as likely as numbers in the telephone directory to be included in the survey. Phone calls are made at times of the day when people are likely to be home, that is, primarily in the evenings on weekdays, and in the late morning and early afternoon on weekends. Eligible respondents must reside in the household and be 18 years of age or older.

DEMOGRAPHIC AND RISK VARIABLE CLASSIFICATIONS

Respondents who answered "don't know," refused to answer, or who offered an inappropriate response were not included in the calculation of response percentages reported. Sample size, therefore, varies from question to question to some degree. Percents may not add to one hundred due to rounding.

Racial categories used were white, black, and other, since recent population estimates were available for these three groups. A question on ethnicity was asked in the 1988 BRFS. Persons who reported they were Hispanic were included in the "other" race category. Since the category of "other" includes a diverse range of ethnic groups and the number of respondents in this category was small, no useful race/ethnic specific estimates could appropriately be made from these data for this heterogeneous segment of Michigan's population.

In determining the definitions for the demographic and risk variables, several criteria were used. Among them were: (1) improve measurement (2) allow comparability to previous Michigan-specific estimates, (3) allow comparability to national estimates, and (4) follow CDC BRFS standards. Footnotes in the tables should make clear the specific definitions employed.

REPRESENTATIVENESS OF THE DATA

Two major types of errors are possible in health behavior survey research. Systematic error refers primarily to poor measurement. Assessment of the degree of measurement error requires reliability and validity studies, examining such biases as overreporting and underreporting. For this project, special efforts to study measurement errors were beyond the scope and available resources. Other researchers have found that there is good congruence between telephone and household data collection approaches, and little difference in the amount of bias between demographic sub-groups, although bias did differ from one risk factor to another.[7]

The second type of error that is possible in health survey research is sampling error. Sampling errors are introduced by the element of chance, and have to do with how representative the sample is, and the size of the margin of error.

The unweighted sample overrepresented females, races other than white,* and persons between 25 and 44 years of age. This overrepresentation may have occurred because of differences in telephone coverage for demographic sub-groups and differential rates of non-response. Therefore, in addition to weighting on two sampling factors (the reciprocal of the number of phone numbers and the number of household members), the sample was weighted to the 1987 intercensal estimates for age, sex, and race.[9] This weighting procedure resulted in a sample distribution that more closely approximated the official Michigan population distribution for sex and race, although it made the age distribution slightly worse. Since the weighting procedure adjusts for age, sex and race equally and simultaneously, the weighting improved the sample distribution, but not to a level of complete representativeness. All analyses reported were performed following weighting.** Table 2 presents a

---

* A report on minority health in Michigan notes evidence of undercounting of the minority population in Michigan.[8]

**The Michigan weighting procedure differs from the CDC procedure in the following two ways: (1) three race subgroups were used (white, black, and other), while CDC uses white and non-white, and (2) CDC adjusts for size of the cluster.

TABLE 2

Comparison of 1988 Survey Sample (Weighted and Unweighted)
With 1980 Census and 1987 Intercensal Estimates
For Age, Sex, and Race
(in percent)

Demographic Characteristics	Unweighted Sample	Weighted Sample[1]	1980 Census	1987 Intercensal Estimates[2]
Age				
18-24	12.7	18.5	19.3	15.9
25-34	24.5	22.8	23.3	23.3
35-44	22.7	18.3	15.8	19.0
45-54	13.5	15.0	14.3	13.7
55-64	11.5	12.4	13.3	12.3
65 and Over	15.1	13.1	14.0	15.8
Sex				
Male	40.0	48.3	48.8	47.8
Female	60.0	51.7	51.2	52.2
Race				
White	82.7	86.8	N/A	86.6
Black	11.8	12.0	12.9	12.2
Other	5.6	1.2	N/A	1.2

[1]Weighted to 1987 intercensal Michigan population estimates by age, sex and race; and for number of phone lines and number of household members.

[2]Published by the Office of the State Registrar and Center for Health Statistics, Michigan Department of Public Health.

comparison of both the weighted and unweighted sample demographics with 1980 Census and 1987 intercensal projections for age, sex, and race demographic sub-groups. Respondents with values missing for variables used in the weighting were excluded from the analysis.

The final sample size was 1332, with a completion rate of 59.5% and a refusal rate of 33.5%.* In 1987, the Michigan BRFS completion rate was 75.4% with a 20.2% refusal rate. One reason for the lower completion rate may be the increased use of telephone answering machines to screen telephone calls. National BRFS completion rates have ranged from 62.9% in 1981-83 to 67% in 1988, with refusal rates of approximately 16%.

The estimates in this report must be interpreted cautiously in light of the less than optimal completion rate and high refusal rate in the data collection. Tables A-1 through A-5 in the Appendix present the 95% confidence interval for total percents, as well as percents for age, race, sex, income, and education subgroups. The formula provided by Waksberg was used,[5] and an intracluster correlation coefficient of 0.10 was assumed.

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*The sum of the completion rate and the refusal rate does not equal 100% due to differences in the denominator used in computing the rates. See reference 1 for details.

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Tobacco Use

Cigarettes have been implicated as a cause of countless physical ailments, chronic diseases, and social complaints. Cigarette smoking is a significant risk factor for heart disease, cancers of the lung and throat, chronic bronchitis, emphysema, and stroke,[1] and these risks increase with the number of cigarettes smoked per day. Moreover, smoking even 1 to 4 cigarettes per day has been associated with a two- to three-fold increase in the risk of fatal coronary heart disease and stroke.[2,3] Smoking causes more premature deaths than do all the following together: acquired immunodeficiency syndrome, cocaine, heroin, alcohol, automobile accidents, fire, homicide and suicide.[4,5] Over 16,000 Michigan adults died during 1987 from diseases attributable to smoking.[6,7]

In the U.S. between 1974 and 1985, approximately 1.3 million persons quit smoking per year, indicating considerable success in public health efforts to encourage this behavior change.[8] There is increasing evidence that no matter how long one has smoked, quitting significantly reduces one's risk of developing smoking-related disease. This is encouraging long-term cigarette smokers to quit.[2,3] The decline in the national prevalence of cigarette smoking, by 0.59 percentage points per year from 1974 to 1985, is steady and shows no signs of diminishing.[8] However, the rate of decline is considerably slower in certain sociodemographic subgroups, most notably in young women, black and other minority populations, and those with fewer years of formal education.[8-11]

The Surgeon General's goal for this risk factor states that the proportion of adults who smoke should be reduced to below 25% by 1990.[12] A newly released report by the Michigan Department of Public Health, Tobacco-Free Michigan: A Report of the 1989 Michigan Tobacco Reduction Task Force, has announced a goal of reducing the use of tobacco products in Michigan to less than 15% by the year 2000.[7]

NATIONAL AND OTHER MICHIGAN ESTIMATES

Data from the National Health Interview Surveys (NHIS) indicate that the smoking prevalence for the U.S. adult population fell from 40.4 percent in 1965 to an estimated 29.1 percent in 1987.[8] Behavioral Risk Factor Survey (BRFS) data from 1982 representing 32 states estimated smoking prevalence at 31.5%;[13] the Michigan BRFS data for that year indicated a slightly higher prevalence rate of 32.4%,[14] falling to 28.9% in 1987.[15] Nationally, the quit ratio (the proportion of ever smokers who are former smokers) increased from about 35% to 44% between 1974 and 1985.[8] The quit ratio in Michigan increased from 42.1% in 1982 to 44.3% in 1987.

CURRENT FINDINGS

Table 3 presents the proportion of current and former smokers, as well as non-smokers, by age, race, sex, education, and household income.

Of all Michigan adults in 1988, 26.7% reported that they are currently cigarette smokers, 24.8% reported that they had smoked at least 100 cigarettes in the past but have now quit (former smokers), and 48.5% reported never having smoked as many as 100 cigarettes in their lifetime.

The age groups with the largest proportion of current smokers are the 25-34 and 35-44 year age groups at 31.3% and 31.7%, respectively. However, in the youngest age category (18-24 years), more than one in four are current smokers. Several studies have shown that the majority of individuals who initiate smoking do so during the high school years, and that the rate of decline in smoking prevalence is much slower in the youngest age group, emphasizing the need to focus prevention and cessation efforts on adolescents.[8,16,17]

The proportions of males and females that are current smokers are quite similar, at 27.4% and 26.0%, respectively. Differences in smoking behavior by sex are apparent in that more males than females report ever-smoking (56.1 vs. 47.1); on the other hand, more males who have ever been smokers have quit. National

TABLE 3

Smoking Status, by Demographic Characteristics,
Michigan Adults, 1988
(in percent)

Demographic Characteristics	SMOKING STATUS		
	Current[1]	Former[2]	Never[3]
Total[4]	26.7	24.8	48.5
Age			
18-24	25.8	12.7	61.5
25-34	31.3	20.2	48.5
35-44	31.7	28.9	39.4
45-54	25.0	29.8	45.2
55-64	25.2	30.5	44.3
65 and Over	16.0	33.0	51.0
Sex			
Male	27.4	28.7	43.9
Female	26.0	21.2	52.9
Race			
White	27.5	25.6	46.9
Black	19.9[5]	20.4	59.7
Education			
Less than H.S.	40.0	22.5	37.5
H.S. Graduate	31.6	22.2	46.3
Some College	23.5	26.5	50.0
College Graduate	9.8	30.0	60.2
Income			
Less than $10,000	39.6	18.6	41.8
$10,000 - $19,999	26.7	25.2	48.1
$20,000 - $35,000	31.5	21.7	46.8
Greater than $35,000	18.2	29.3	52.5

[1]Those who answered "yes" to the question: "Do you smoke cigarettes now?"

[2]Those who reported they had smoked at least 100 cigarettes in their entire life, and answered "no" to the "current smoker" question.

[3]Never smoked as many as 100 cigarettes in their lifetime.

[4]Includes persons whose education and/or income characteristics were unknown or unreported.

[5]See comment on page 16.

estimates mirror these Michigan trends; additionally, whereas the rate of smoking initiation has been declining in men, this rate has remained constant in women.[11] Taking these facts into consideration, national smoking rates of 20% among men and 23% among women are projected for the year 2000.[8]

The 1988 BRFS data indicate that a higher percentage of whites than blacks have ever smoked. Quit ratios (48% and 51% for the white and black populations, respectively) are similar for both races. The relatively low rate of smoking for blacks found in these data (19.9%) is not supported by the 1987 National Health Interview Survey estimate of 34.0%[7] nor by 1987 Michigan BRFS data, where 34.8% of blacks reported current smoking. Considering the small number of blacks in this sample and the correspondingly high standard error for this estimate, as well as the less than optimal completion rate for this survey, this aberrant finding must be interpreted with extreme caution.

When reviewing smoking status by years of formal education, there is an inverse relationship, with the current smoking proportion decreasing as years of education increase. Of those in the population with less than a high school education, 40.0% are current smokers, whereas 9.8% of college graduates report being current cigarette smokers. The pattern reverses when looking at the quit ratio, ranging from 36% of those with less than a high school education to 75% of college graduate ever-smokers who have quit. Reports based on national data from the BRFS and the NHIS state that educational attainment levels have become the major sociodemographic predictor of smoking status, and that smoking in the United States is increasingly becoming a behavior primarily of the less educated and the socioeconomically disadvantaged.[8,10,13]

The proportion of current smokers ranges from 18.2% of those with incomes greater than $35,000 to 39.6% of those with incomes less than $10,000. There is no consistent pattern, however, of cigarette smoking decreasing with increasing income. The largest proportion of quitters is in the greater-than-$35,000 income group, with 62% of those who have ever smoked having quit.

TABLE 4

Number of Cigarettes Smoked Per Day,
by Demographic Characteristics,
Current Michigan Adult Smokers, 1988
(in percent)

Demographic Characteristics	AVERAGE NUMBER OF CIGARETTES SMOKED PER DAY[1]				
	≤ 10	11-19	20 (1 pack)	21-30	> 30
Total[2]	26.5	13.3	34.2	14.2	11.7
Age					
18-24	33.3	14.8	21.4	18.3	12.2
25-34	26.0	12.4	41.1	13.5	7.0
35-44	22.6	18.0	32.4	16.8	10.2
45-54	21.6	12.9	33.8	11.4	20.3
55-64	27.5	8.7	39.3	7.5	17.0
65 and over	31.5	7.3	37.8	15.3	8.0
Sex					
Male	21.8	11.3	35.2	16.2	15.4
Female	31.1	15.3	33.3	12.3	8.1
Race					
White	24.7	12.7	34.7	15.1	12.8
Black	44.7	22.0	26.0	6.2	1.2
Education					
Less than H.S.	20.7	12.1	33.9	13.6	19.7
H.S. Graduate	26.5	12.8	35.7	17.6	7.4
Some College	29.8	14.8	33.4	8.6	13.4
College Graduate	36.0	16.7	30.2	15.2	1.9
Income					
Less than $10,000	31.4	25.7	22.7	9.3	11.0
$10,000 - $19,999	20.3	11.0	41.3	15.5	11.9
$20,000 - $35,000	32.7	10.0	34.5	13.3	9.5
Greater than $35,000	21.7	14.3	33.1	15.1	15.7

[1]Reflects categorization of responses to the question: "On the average, about how many cigarettes a day do you now smoke?" This question was only asked of current smokers.

[2]Includes persons whose education and/or income characteristics were unknown or unreported.

Amount Smoked

Almost three-quarters of current cigarette smokers reported smoking, on average, one pack of cigarettes or less per day (Table 4). Smokers with the greatest cigarette consumption (more than 30 cigarettes per day) are those 45 to 54 years of age, males, white smokers, those with less than a high school education, and those with household incomes greater than $35,000 per year.

Current Smokers Who Quit for a Week or More Last Year

Those who were identified as current smokers were asked, "Have you stopped smoking for a week or more sometime during the past year?" Altogether, 39.8% of current smokers indicated that they had stopped smoking for at least a week during that time period (Table 5). Smokers in the 18-24 year age group were most likely to respond "yes" to this question; smokers in the 45-54 year age group were the most likely to respond "no." Slightly more male smokers than female smokers, and slightly more white smokers than black smokers indicated that they had stopped smoking for at least a week in the previous year. Those smokers with less than high school education and those with an annual income less than $10,000 were the least likely to report having stopped smoking for a week or more in the past year.

COMMENT

The prevalence of current smoking in Michigan, as measured through the BRFS, has declined from 32.4% in 1982 to 28.9% in 1987; the decline continues, with 26.7% of the adult population reporting current smoking in 1988. Overall, the trend is very encouraging.

A higher-than-average rate of current smoking combined with a lower-than-average quit rate identifies those with less than a high school education as a group with the greatest need for improved smoking prevention and cessation interventions. Women's lower than average quit rate also indicates a need for targeted smoking cessation. Although current smoking in the 18 to 24 year age group is slightly below average, this rate of smoking indicates a need for improvements in smoking prevention among adolescents.

TABLE 5

Current Smokers Who Stopped Smoking For A Week Or More During the Past Year, by Demographic Characteristics, Michigan Adults, 1988
(in percent)

Demographic Characteristics	STOPPED SMOKING FOR A WEEK LAST YEAR[1]	
	Yes	No
Total[2]	39.8	60.2
Age		
18-24	50.8	49.2
25-34	45.4	54.6
35-44	37.6	62.4
45-54	29.5	70.5
55-64	33.5	66.5
65 and Over	30.0	70.0
Sex		
Male	41.1	58.9
Female	38.6	61.4
Race		
White	40.4	59.6
Black	32.2	67.8
Other	53.1	46.9
Education		
Less than H.S.	26.4	73.6
H.S. Graduate	45.0	55.0
Some College	45.6	54.4
College Graduate	33.7	66.3
Income		
Less than $10,000	31.8	68.2
$10,000 - $19,999	38.1	61.9
$20,000 - $35,000	44.8	55.2
Greater than $35,000	40.8	59.2

[1]Responses to the question, "Have you stopped smoking for a week or more sometime during the past year?" This question was only asked of current smokers.

[2]Includes persons whose education and/or income characteristics were unknown or unreported.

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Seat Belt Use

Although progress has been made toward protecting people from injuries due to motor vehicle crashes, this mode of injury continues to account for a substantial proportion of all serious injuries and deaths. According to the National Safety Council, motor vehicle related injuries account for half of all injury deaths and approximately one fifth of all disabling injuries.[1]

Buckling up, an activity which takes approximately three seconds, has been shown to be an effective and simple means of protecting motor vehicle occupants from injuries and death. The U.S. Department of Transportation's National Highway Traffic Safety Administration estimates that between 1983 and 1987, seat belts saved the lives of approximately 10,938 travelers over four years old in the front seats of passenger vehicles.[2] The arguments for seat belt use in preventing injuries have been so overwhelmingly favorable that many states (33 states and Washington, D.C. in 1989) now have laws which require that occupants wear seat belts. Michigan implemented legislation mandating the use of seat belts on July 1, 1985. Research findings on the effects of Michigan's belt law on motor vehicle crash injury hospitalizations indicate that seat belt use has resulted in a 19.3% decline in injury hospitalizations, with a 24.1% decline in hospitalizations lasting over one week.[3]

Injuries due to motor vehicle crashes not only cause much physical and emotional suffering, but they take a toll on the health care system in terms of medical costs and provider resources. The Office of Health and Medical Affairs and the Center for Health Promotion reported on the cost-benefit and cost-effectiveness of seat belt intervention, and estimated that $105.07 would be saved for each dollar invested in a seat belt promotion program.[4]

NATIONAL AND OTHER MICHIGAN ESTIMATES

Precise estimates of seat belt use are difficult to derive since data are usually obtained through limited observational studies or are based on self-reports. National estimates may not be useful since rates vary greatly from state to state (and within different regions in each state) and are related to seat belt legislation which has been changing quickly during the past five years.

Observational studies of seat belt use have been conducted in Michigan since 1984, and have found that overall restraint use increased from 19.8% in 1984 to 58.4% in 1985 when the law went into effect, then leveled off to approximately 46% from 1986 to 1987.[5] These studies show that seat belt use increased with age, with rates of 38.8% among motor vehicle occupants age 16-29, 48.9% among occupants age 30-59, and 58.0% among occupants age 60 and older. Females exhibited higher restraint use than males. The 1982 Michigan BRFS, conducted prior to the law, recorded 75% of the adults using seat belts infrequently (sometimes, seldom, or never), whereas only 25% reported using belts frequently (always or nearly always).[6] After the seat belt law went into effect, proportions in these self-reported categories were reversed. In the 1987 BRFS, 75% reported frequent use of seat belts while only 25% of the adults reported infrequent use.[7]

CURRENT FINDINGS

Self-reported frequencies of seat belt use for Michigan adults by age, race, sex, education, and household income are displayed in Table 6. Approximately 58% of the respondents indicated that they always wear a seat belt when driving or riding in a car, while almost 20% reported "nearly always" wearing a seat belt. Approximately 17% of the respondents indicated that they wore seat belts infrequently and only 6% reported never using a seat belt. Respondents with the highest frequencies of infrequent or no belt use were young (18-34), male, black, had not graduated from college, or had lower incomes (<$35,000) than those who reported using seat belts "always" or "nearly always."

TABLE 6

Frequency of Seat Belt Use, by Demographic Characteristics, Michigan Adults, 1988
(in percent)

Demographic Characteristics	FREQUENCY OF SEAT BELT USE[1]				
	Always	Nearly Always	Sometimes	Seldom	Never
Total[2]	57.4	19.4	11.3	5.9	6.1
Age					
18-24	45.8	22.0	17.8	9.6	4.8
25-34	53.7	22.1	9.1	5.6	9.5
35-44	63.0	19.7	9.4	5.1	2.8
45-54	60.8	15.0	11.1	4.8	8.3
55-64	63.9	19.1	9.7	3.6	3.7
65 and Over	62.2	15.5	10.2	5.5	6.5
Sex					
Male	51.6	20.5	11.6	7.3	8.9
Female	62.8	18.3	11.0	4.5	3.5
Race					
White	58.8	19.2	9.9	5.9	6.2
Black	46.8	20.5	21.8	5.7	5.2
Education					
Less than H.S.	47.3	15.3	17.4	4.7	15.3
H.S. Graduate	51.3	21.4	13.5	7.2	6.7
Some College	59.7	23.6	8.4	5.2	3.1
College Graduate	75.1	12.5	5.4	5.2	1.8
Income					
Less than $10,000	53.6	15.0	15.0	11.7	4.7
$10,000 - $19,999	53.6	21.5	12.7	5.4	6.7
$20,000 - $35,000	54.1	25.4	12.3	3.3	4.9
Greater than $35,000	63.7	15.4	8.6	6.5	5.8

[1]Reflects responses to the question: "How often do you use seat belts when you drive or ride in a car?" Persons who responded "never drive or ride in a car" were not included in the analysis.

[2]Includes persons whose education and/or income were unknown or unreported.

The proportion of respondents indicating that they "always" or "nearly always" wear a seat belt has increased from 25.9% in the 1982 BRFS to 76.8% in the current survey, thus suggesting the effectiveness of the 1985 legislation which mandated the use of seat belts in Michigan. The proportion reporting infrequent seat belt use decreased from 74.1% in 1982 to 23.3% in 1988.

COMMENT

Restraint use legislation has contributed to a substantial increase in the rate of seat belt use in Michigan. However, much work still needs to be done in order for Michigan to reach the 1990 Objectives for the Nation of "70 x 90" (70% usage by 1990).[8] Although the percentage of Michigan adults who report they "always" or "nearly always" use seatbelts is 76.8%, Streff and Wagenaar have reported substantial bias in self-reporting of seatbelt use.[9] Applying their correction to these data, adult seat belt use in Michigan may be about 65%, that is, about 12% lower than was self reported.

In addition to strict enforcement of seat belt laws, safety belt education programs which focus on high risk groups need to be implemented and evaluated in order to convince people that seat belts can save lives and prevent injuries only if they are worn consistently and properly while traveling in a motor vehicle. Conducting such education at the workplace with curbside surveys, promotional campaigns and educational sessions would be most beneficial to employees as well as having a favorable impact on business health care costs.

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Alcohol Use

The drinking of alcoholic beverages has been associated with a wide range of life events, from celebration and social entertainment to the development of chronic diseases and injury-related mortality. There is convincing evidence that heavy alcohol consumption increases the risk of serious diseases of the liver, pancreas, brain, and gastrointestinal, cardiovascular, and endocrine systems.[1] While chronic heavy drinking is strongly associated with the development of chronic disease processes, acute or "binge" drinking is typically associated with negative episodic events, such as intentional or unintentional injury.[2,3] Alcohol makes a major contribution to motor vehicle-related injuries and fatalities.[4] A strong and significant correlation was reported between the prevalence of drinking and driving and the injury crash rate in Michigan.[5] Substantial proportions of adults who die from other injuries, including falls, drowning, assaults, and suicide, have blood alcohol concentrations of 0.10 percent or higher.[6] Additionally, a recent review highlighted the association between alcohol and injury or death due to fires and burns.[7]

Overall, the social and economic costs and consequences of alcohol-related problems to families, employers, and health service facilities are enormous. One estimate places the annual cost of alcohol use/abuse at $117 billion nationally.[8] The 1990 Objectives for the Nation's Health include several goals related to alcohol use, among them the reduction of alcohol-related motor vehicle crash fatalities and lowering the annual cirrhosis mortality rate. Another less easily measured goal is to reduce the proportion of "problem" drinkers among all adults ages 18 years and over to no more than eight percent.[9]

TABLE 7

Drinking Status, by Demographic Characteristics,
Michigan Adults, 1988
(in percent)

Demographic Characteristics	DRINKING STATUS			
	Abstainers[1]	Light Drinkers[2]	Moderate[3]	Heavy[4]
Total[5]	38.6	30.4	20.5	10.5
Age				
18-24	32.8	24.5	28.2	14.5
25-34	31.3	30.5	28.2	10.0
35-44	33.3	44.0	14.0	8.7
45-54	40.3	28.1	19.3	12.4
55-64	39.9	31.4	16.9	11.7
65 and Over	63.7	21.2	10.2	4.9
Sex				
Male	29.7	27.7	25.9	16.7
Female	46.9	32.9	15.5	4.7
Race				
White	37.1	29.6	21.7	11.6
Black	49.1	35.5	12.3	3.0
Education				
Less than H.S.	55.5	22.0	14.3	8.2
H.S. Graduate	40.7	29.1	19.4	10.8
Some College	33.8	35.4	20.4	10.4
College Graduate	27.5	32.1	28.7	11.8
Income				
Less than $10,000	51.9	25.1	14.3	8.7
$10,000 - $19,999	46.9	28.4	17.0	7.6
$20,000 - $35,000	33.8	34.3	20.5	11.5
Greater than $35,000	29.8	31.0	26.5	12.8

[1]Includes persons who reported that they had consumed no alcoholic beverages during the past month.

[2]Three drinks or less per week, including beer, wine and liquor.

[3]Four to thirteen drinks per week.

[4]Fourteen or more drinks per week.

[5]Includes persons who education and/or income were unknown or unreported.

NATIONAL AND OTHER MICHIGAN ESTIMATES

Estimates from the 1982 Michigan BRFS indicated that 7.5% of the adult population were chronic heavy drinkers (two or more drinks per day), while 23.6% were abstainers.[10] Almost 31% were acute drinkers (five or more drinks on one or more occasions during the past month).[11] Anda and coworkers reported an overall Michigan drinking and driving prevalence rate of 7.5%, with the highest prevalence (31.7%) among 18 to 24 year old males.[5] Data from the 1987 Michigan BRFS produced estimates as follows: 38.9% abstained from alcohol, 8.8% were chronic heavy drinkers, 22.5% were acute drinkers, and 5.4% reported drinking and driving.[12]

On the national level, the 1985 National Health Interview Survey classified 13% of male respondents and 3% of female respondents as chronic heavy drinkers.[13] Combined 1987 BRFS data from 32 states and the District of Columbia indicate a chronic heavy drinking median rate of 8.7% and a median rate for acute drinking of 15.3%.[14] Drinking and driving ranged from a low of 1.3% to a high of 8.3% across the reporting states. National prevalence of drinking and driving was estimated to be 3.6% using data from the 1986 BRFS.[15]

CURRENT FINDINGS

Table 7 presents drinking status for the adult Michigan population by age, race, sex, education, and household income in 1988. The proportion abstaining from the use of alcohol in the month prior to the interview was 38.6%, with women more likely than men to report no alcohol use, and blacks more likely than whites to be abstainers. Abstaining was more prevalent in older age groups, and was inversely related to education and income.

Chronic Heavy Drinking

The overall rate for chronic heavy drinking was 10.5%. Women were less likely than men to be chronic heavy drinkers, and blacks were less likely than whites to report chronic heavy drinking. No consistent relationship by age, income or education is apparent.

TABLE 8

Acute Drinking, Drinking and Driving, by Demographic Characteristics, Michigan Adults, 1988
(in percent)

Demographic Characteristics	Acute Drinking[1]	Drinking and Driving[2]
Total[3]	24.3	5.4
Age		
18-24	42.7	8.6
25-34	33.6	7.8
35-44	19.8	5.5
45-54	20.9	3.9
55-64	13.3	3.5
65 and Over	3.7	-[4]
Sex		
Male	34.4	8.3
Female	15.0	2.7
Race		
White	26.2	6.1
Black	12.0	1.0
Education		
Less than H.S.	21.2	2.1
H.S. Graduate	25.5	5.2
Some College	23.9	6.2
College Graduate	24.4	6.8
Income		
Less than $10,000	22.4	4.0
$10,000 - $19,999	18.1	3.8
$20,000 - $35,000	29.0	7.3
Greater than $35,000	26.9	5.9

[1]Responds one or more occasions to the question: "Considering all types of alcoholic beverages, that is beer, wine and liquor as drinks, how many times during the past month did you have five or more drinks on one occasion?"

[2]Respondents who report having driven one or more times during the past month after having too much to drink.

[3]Includes persons whose education and/or income were unknown or unreported.

[4]This behavior was not reported by anyone in this category in the sample.

Acute Drinking

As shown in Table 8, the 1988 acute drinking prevalence for Michigan was 24.3%. Acute drinking was inversely related to age, twice as likely among males, twice as likely among whites, and was lowest among those with less than a high school education.

Drinking and Driving

Driving while having had "perhaps too much to drink," was reported by 5.4% of the adult Michigan population in 1988 (Table 8). Drinking and driving was inversely related to age, more than twice as likely among males, greater among whites than among blacks, and directly related to years of education. There was no consistent trend by income.

COMMENT

Measures of alcohol use in Michigan indicate usage well above the median rates among BRFS-reporting states for drinking and driving, chronic heavy drinking, and acute drinking.[14] Males in general are at higher risk for these behaviors than are females.

Although the Surgeon General's 1990 goal of reducing annual fatalities from alcohol-related motor vehicle crashes to 9.5 per 100,000 U.S. population has been met on a national basis,[16] Michigan's 1987 rate was 12 per 100,000 population*, suggesting that Michigan still has a great deal to accomplish in reducing the incidence of drinking and driving. The goal of lowering the annual cirrhosis mortality rate to 12 per 100,000 population has been met in Michigan, with a crude rate of 11.9 per 100,000; however, the rate for blacks was substantially higher than that of the population as a whole, at 23.3 per 100,000.[17] This high rate for cirrhosis death raises questions about the validity of the self-reported measures of black alcohol use reported here. Several possible reasons may account for these disparate measures. One, the biological mechanism for cirrhosis may be different or involve other factors for blacks than for whites.[18] Two, there may be bias in the low black alcohol usage rates reported in this study due to under-reporting of alcohol use, lack of telephone coverage or non-response by blacks who do use alcohol more heavily. Third, this may be a function of a low sample size for blacks in this study.

Comparatively high measures of alcohol use in Michigan for drinking and driving, chronic heavy drinking, and acute drinking indicate the need for further efforts aimed at reducing these potentially destructive behaviors. In addition, discrepancies between self-reported and indirect measures of alcohol use among blacks indicate a need for improved information on alcohol usage among blacks.

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*This figure was calculated using the number of alcohol-related motor vehicle fatalities in 1987 (808) and the 1987 Michigan population estimate of 6,698,920. (Sources: Michigan Department of State Police, Traffic Services Section, and the Center for Health Statistics, Michigan Department of Public Health.)

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Weight Status

The long term effects of being over ideal weight and of high fat consumption have been shown to include an increased risk of cardiovascular disease,[1,2] colon and breast cancer,[3] and an inverse relationship with longevity.[4] The Surgeon General's health objectives for 1990 include reducing the proportion of the population which is over the ideal weight to 18% for men and 21% for women.[5] Another goal for 1990 is that 50% of those over the ideal weight should have adopted weight loss regimens, combining an appropriate balance of diet and physical activity. Recently adults who are at lower than the ideal weight have also become a public health concern since their weight status may be associated with conditions such as anorexia or elderly malnutrition.[6]

In this report, the body mass index (BMI) is used to classify an individual's weight status. The BMI, defined as one's weight in kilograms divided by one's height in meters squared, is preferred to the weight-for-height alone scale used in the 1987 Michigan BRFS report[7] for several reasons. First, the BMI has been accepted by the National Center for Health Statistics to monitor progress on weight status towards the 1990 Health Objectives. Second, the BMI has been shown to have a higher correlation with fatness.[8] Third, normative national data on BMI have just become available for the first time from the Second National Health and Nutrition Examination Survey 1976-1980 (NHANES II).[9]

The NHANES II sex-specific BMI categories for persons 20 to 29 years of age are the standards of reference used for all age groups,[10] since weight gained after age 29 is predominantly fat. Weight status is divided into five categories. "Ideal weight" is defined as weight between the 15th and the 85th percentiles of BMI. "Overweight" is weight greater than or equal to the 85th and less than the 95th percentile. "Very overweight" is greater than or equal to the 95th percentile. Similarly, "underweight" is defined

as greater than the 5th and less than or equal to the 15th percentile and "very underweight" as less than or equal to the 5th percentile.

NATIONAL AND OTHER MICHIGAN ESTIMATES

Data from the 1985 National Health Interview Survey indicate that 23.5% of men and 27.1% of women were over the ideal weight[11]. 1987 BRFS national estimates for the proportion of the population over the ideal weight are 21.8% for men and 21.1% for women.[12] Michigan 1987 BRFS figures were 24.6% for men and 20.6% for women, using the BMI standard of reference.[10]

CURRENT FINDINGS

Overweight

Table 9 presents weight status for the Michigan adult population by age, race, sex, education, and household income in 1988. According to the above criteria, 23.5% of the adult Michigan population is overweight or very overweight, including 24.2% of males and 22.8% of females. The proportion of the population over the ideal weight differs by race, with 32.0% of blacks and 22.2% of whites categorized as overweight or very overweight. The proportion of the population over the ideal weight increases with age from 18 to 44 years, and levels off from 45 years of age onwards. Those with more years of education were less likely to be over ideal weight.

Underweight

Underweight or very underweight, as defined using the BMI criteria, is identified in 6.6% of Michigan citizens, with 5.4% of males and 7.8% of females being in one of these categories. The percentage of those under the ideal weight decreases from 16.2% for people ages 18-24 to 0.9% of the 55-64 age group, then increases in the 65 and over age group to 5.5%. A greater proportion of whites (7.3%) than blacks (1.8%) is identified as being under ideal weight. Education was not found to be related

TABLE 9

Weight Status, by Demographic Characteristics, Michigan Adults,[1] 1988
(in percent)

Demographic Characteristics	WEIGHT STATUS[2]				
	Very Overwt	Over-weight	Ideal Weight	Under-weight	Very Underwt
Total[3]	7.9	15.6	69.9	4.0	2.6
Age					
18-24	3.2	7.5	73.1	8.6	7.6
25-34	7.5	11.6	72.1	6.2	2.6
35-44	8.8	18.8	69.2	2.3	1.0
45-54	9.1	22.6	66.9	1.2	.2
55-64	13.0	18.7	67.3	.9	–[4]
65 and Over	7.3	18.4	68.7	2.5	3.0
Sex					
Male	8.4	15.8	70.4	2.5	2.9
Female	7.4	15.4	69.4	5.5	2.3
Race					
White	7.5	14.7	70.5	4.4	2.9
Black	10.3	22.2	65.7	1.5	.3
Education					
Less than H.S.	13.4	21.0	59.7	4.1	1.8
H.S. Graduate	7.8	16.9	69.2	3.6	2.5
Some College	7.5	13.1	72.4	3.8	3.2
College Graduate	3.8	12.6	76.2	5.1	2.4
Income					
Less than $10,000	6.6	17.6	62.5	6.9	6.3
$10,000 - $19,999	8.1	18.4	70.1	1.8	1.5
$20,000 - $35,000	7.6	13.6	71.1	5.1	2.6
Greater than $35,000	8.4	14.5	72.7	3.5	.9

[1]Pregnant women were excluded from the analysis.

[2]Weight status categories are defined as follows: Very Overweight: ≥95th percentile Body Mass Index (BMI); Overweight: ≥85th and <95th percentile BMI; Ideal Weight: >15th and <85th percentile BMI; Underweight: ≤15th and >5th percentile BMI; Very Underweight: ≤5th percentile BMI. The BMI are sex-specific estimates for 20-29 year-olds from the Second National Health and Nutrition Examination Survey 1976-1980.[9]

[3]Includes persons whose education and/or income were unknown or unreported.

[4]This weight status was not calculated for anyone in this group in the sample.

to underweight or very underweight status. However, the lowest income group (i.e., less than $10,000) has a larger proportion being under ideal weight than does the next income group (between $10,000 and $20,000), at 13.2% and 3.3%, respectively.

Weight Control Practices

In reviewing methods of weight control, only the people who were classified as over the ideal weight were included in the analysis. Using diet alone to lose weight is reported by 30.2% of those respondents, 4.0% use exercise alone, and 28.0% use both diet and exercise. (See Table 10.) Fewer older people (65 years of age and older) than younger people, and fewer males than females report using a combination of diet and exercise for weight control. Similar weight control methods were reported by whites and blacks. The likelihood of practicing some method of weight control increases with years of education and household income.

TABLE 10

Weight Control Practices of People Over Ideal Weight,[1]
by Demographic Characteristics,
Michigan Adults, 1988
(in percent)

Demographic Characteristics	WEIGHT CONTROL PRACTICE			
	None	Diet	Exercise	Diet and Exercise
Total[2]	40.9	28.0	4.5	26.6
Age				
18-24	47.0	8.7	8.4	35.9
25-34	42.2	23.7	8.3	25.9
35-44	37.5	27.7	2.0	32.7
45-54	33.6	33.0	6.3	27.1
55-64	33.2	37.0	3.7	26.1
65 and Over	58.8	27.7	-[3]	13.5
Sex				
Male	53.5	25.4	4.4	16.7
Female	29.0	30.5	4.6	35.8
Race				
White	40.2	27.4	5.0	27.3
Black	43.2	32.9	.6	23.3
Education				
Less than H.S.	50.6	26.9	1.3	21.1
H.S. Graduate	42.9	28.9	3.9	24.3
Some College	37.8	24.3	7.0	30.9
College Graduate	24.5	34.7	6.7	34.1
Income				
Less than $10,000	53.1	17.6	2.9	26.4
$10,000 - $19,999	40.3	28.2	6.3	25.1
$20,000 - $35,000	42.2	27.4	4.0	26.4
Greater than $35,000	28.3	36.5	5.1	30.1

[1]Pregnant women were excluded from the sample. "Over Ideal Weight" is defined as weighing ≥ 85th percentile BMI for 20 to 29 year olds. (See reference 8.)

[2]Includes persons whose education and/or income were unknown or unreported.

[3]This behavior was not reported by anyone in this category in the sample.

COMMENT

With the prevalence of overweight and very overweight in Michigan being 24.2% for men and 22.8% for women, neither males nor females in the state have achieved the Surgeon General's objective for 1990. More blacks than whites appear to be overweight or very overweight. Increasing age directly relates to the proportion of the population over ideal weight.

Those in Michigan over ideal weight have not yet met the Surgeon General's Objectives in their efforts at weight control. In these data, older people, those with fewer years of education, and males are less apt to adopt the recommended weight control method of combining diet and exercise.

The Michigan Health Council has published interim guidelines[13] for adult weight loss programs in Michigan. The four components considered essential for weight loss care include an exercise component and a nutrition component, as recommended by the Surgeon General. Additionally, psychosocial intervention and health and/or medical supervision appropriate to the individual's health status are recommended.

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ERRATA

Page 45
Second paragraph, second sentence, "49%"should read "54.3%".

Page 47
First paragraph, second sentence, "51%"should read "45.7%

Health Risk Behaviors, 1988
Brown S, Chan V, Mills EM, et al.
Michigan Department of Public Health, Lansing, MI, 1990.

Physical Activity

Just as personal hygiene habits are associated with a risk of infectious disease, personal health habits have an effect on one's risk of morbidity and mortality from chronic conditions, such as coronary disease, cancer, and emphysema.[1] Results from a prospective study of healthy men and women suggest that sedentary living habits and a low level of physical fitness are important risk factors for early death.[2] Paffenbarger and Hyde demonstrated that regular physical exercise was associated with a reduced risk of coronary heart disease.[3] Exercise also appears to be an important factor in the prevention and control of hypertension, diabetes mellitus, and osteoporosis.[4,5]

In addition, regular exercise may also reduce symptoms of depression and anxiety.[6] The psychological rewards gained from physical exercise are important factors in identifying incentives to continue an activity.

However, despite the variety and depth of research in this area, reliable and precise conclusions regarding the effects of exercise have been difficult to make due to the wide range of definitions and criteria used for measuring physical activity.

NATIONAL AND OTHER MICHIGAN ESTIMATES

Varying definitions of physical activity have resulted in different estimates of the proportion of adults who are physically active, ranging from a low of 15% to a high of 78%.[7] Using the CDC definition of physical activity, which is, "daily expenditure of 3 or more kilocalories per kilogram of body weight on a single major activity," White and Powell estimated that 21% of the U.S. adult population was physically active.[8]

Results from the 1982 Michigan BRFS indicated that 9.3% of adults had a sedentary lifestyle, 20.6% reported being somewhat

TABLE 11

Any Exercise During the Past Month, by Demographic Characteristics, Michigan Adults, 1988
(in percent)

Demographic Characteristics	EXERCISE DURING THE PAST MONTH[1]	
	Yes	No
Total[2]	72.4	27.6
Age		
18-24	78.2	21.8
25-34	77.8	22.2
35-44	73.7	26.3
45-54	75.4	24.6
55-64	66.3	33.7
65 and Over	55.4	44.6
Sex		
Male	76.1	23.9
Female	68.9	31.1
Race		
White	74.2	25.8
Black	59.6	40.4
Education		
Less than H.S.	56.6	43.4
H.S. Graduate	66.9	33.1
Some College	77.5	22.5
College Graduate	89.4	10.6
Income		
Less than $10,000	58.2	41.8
$10,000 - $19,999	66.5	33.5
$20,000 - $35,000	75.1	24.9
Greater than $35,000	82.3	17.7

[1]Responses to the following question: "The next few questions are about exercise, recreation, or physical activities other than your regular job duties. During the past month, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?"

[2]Includes persons whose education and/or income were unknown or unreported.

active, 35.2% were moderately active, and 34.9% were active.[9] Due to modifications to the interview protocol, 1987 and 1988 Michigan BRFS results are not comparable to those from 1982. Data from the 1987 Michigan BRFS indicate that 70.9% of adults reported participating in physical activity during the past month and 29.1% reported that they were not active.[10]

CURRENT FINDINGS

The proportion of Michigan adults participating in any exercise during the previous month by age, sex, race, education, and household income during 1988 is presented in Table 11. Overall, 72.4% of adults reported exercising during the previous month. The proportion of adults reporting participation in physical activity decreases with age, but increases with increasing educational level and household income. A slightly higher proportion of males reported exercising compared to females, and a greater proportion of whites than blacks reported exercising.

The CDC has developed a method for the classification of "at risk" groups based on the quality and consistency of physical activity patterns.[11] Using that definition, 49% of Michigan adults are considered "at risk" for developing complications associated with a sedentary lifestyle. The sedentary lifestyle group includes those reporting "any activity done for less than 20 minutes or less than three times per week or no reported activity." As shown in Table 12, a sedentary lifestyle was positively associated with age and inversely associated with level of education and income. Blacks and females were more likely to be "at risk" than whites or males.

According to the CDC classification method, those "not at risk" are defined as persons who perform any physical activity that requires rhythmic contraction of large muscle groups for 20 minutes or more, three or more times per week. In other words, in order to move from a "sedentary lifestyle" into the "not at risk" category, a person could walk briskly, jog, or play racquetball (or

TABLE 12

Classification of Leisure Time Physical Activity Patterns,
by Demographic Characteristics,
Michigan Adults, 1988
(in percent)

Demographic Characteristics	PHYSICAL ACTIVITY PATTERNS[1]	
	Active	Sedentary (at risk)
Total[2]	45.7	54.3
Age		
18-24	56.7	43.3
25-34	47.1	52.9
35-44	45.8	54.2
45-54	44.8	55.2
55-64	36.3	63.7
65 and Over	36.7	63.3
Sex		
Male	47.8	52.2
Female	43.7	56.3
Race		
White	47.7	52.3
Black	31.6	68.4
Education		
Less than H.S.	35.2	64.8
H.S. Graduate	40.9	59.1
Some College	48.8	51.2
College Graduate	60.6	39.4
Income		
Less than $10,000	34.1	65.9
$10,000 - $19,999	42.3	57.7
$20,000 - $35,000	48.1	51.9
Greater than $35,000	52.7	47.3

[1]Classification based on CDC definitions according to frequency, duration, and type of leisure time physical activity. Groups "at risk" are defined as those reporting "any activity or activities engaged in for less than 20 minutes at each occasion, less than 3 times per week or no reported activity."

[2]Includes persons whose education and/or income were unknown or unreported.

perform a variety of other aerobic activities using the large muscle groups) for at least 20 minutes, three times per week.

COMMENT

According to the 1990 Health Objectives for the Nation, at least 60% of adults ages 18 to 65 should be participating in regular, vigorous physical exercise.[12] In 1988, 51% of Michigan adults reported physical activity which met the CDC definition for physically active. While it is encouraging that over 70% of Michigan adults reported participating in any exercise during the previous month in 1988, it is important to recognize that the type, frequency, and duration of the exercise may not have been sufficient to meet the 1990 Health Objectives for physical fitness.

Since the psychological benefits of exercise are an important factor in the adoption and maintenance of an exercise regimen, interventions aimed at changing personal behavior may be more effective if they emphasize the mental health benefits, in addition to the physical health benefits of regular exercise.

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High Blood Pressure

High blood pressure* is an asymptomatic, controllable disease. It is a major contributor to morbidity and mortality due to stroke, kidney failure, and heart and blood vessel disease. The cost of cardiovascular disease in 1988 is estimated by the American Heart Association at $83.7 billion.[1] This figure includes the cost of physician and nursing services, hospital and nursing home services, medications, and lost productivity resulting from disability.

Data from the Framingham study show that, compared to normotensive individuals, those with high blood pressure have three to four times the risk of developing coronary heart disease and as much as seven times the risk of developing a stroke.[2]

Numerous studies have shown that lowering high blood pressure decreases morbidity and mortality from stroke and heart disease.

The high prevalence of high blood pressure and its serious medical consequences as well as the known efficacy of its control require a continued public health policy and intervention program.

Deaths from cardiovascular disease have decreased steadily in the United States since the mid-1960's.[3] It is theorized that a major factor in the decline has been a result of the progress made in the identification, diagnosis, and treatment of this disease.

NATIONAL AND OTHER MICHIGAN ESTIMATES

It is estimated that 58 million, or 30%, of the American adult population has high blood pressure, including approximately 29% of whites and 38% of blacks.[4]

In the last two decades, significant progress has been made in the detection, evaluation, and treatment of high blood pressure,

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*High blood pressure is defined as blood pressure measurements ≥140mm Hg systolic and/or ≥90mm Hg diastolic, or reported taking antihypertensive medication.

with 54% of those with high blood pressure being aware of it, and 33% of diagnosed hypertensives on medication to lower it. However, only 11% of hypertensive individuals have their blood pressure under control (i.e., less than 140/90.)[4] Current results show that 75% of Americans have had their blood pressure measured within six months and almost every American has had a blood pressure check once within the last two years.[5]

CURRENT FINDINGS

Table 13 presents the 1988 prevalance estimates of current high blood pressure among the Michigan adult population by age, race, sex, education, and household income. Responses show that 18.2% of Michigan adults report that they have high blood pressure. White Michigan residents report 18% current high blood pressure and black Michigan residents 23%. The proportion of the population with high blood pressure increases with advancing age. High blood pressure continues to be inversely related to education and income, as demonstrated in previous Michigan data as well as national reports.[6,7] There is little difference in prevalence between males and females.

COMMENT

The reported prevalence of high blood pressure of 18.2% is consistent with 1987 Michigan BRFS data (18.4%).[6] Michigan's 1983 household survey of hypertension prevalence, knowledge, and attitudes found 27.6% prevalence.[8] Possible reasons for this difference in rates include non-comparability of the questions asked in the survey as well as differences in self-reported versus physically measured conditions. Comparing national data and other studies from previous years is not always possible or worthwhile, since phrasing of questions and/or the definition of high blood pressure may differ. For example, the cutpoints for the definition

TABLE 13

Current High Blood Pressure, by Demographic Characteristics
Michigan Adults, 1988
(in percent)

Demographic Characteristics	HIGH BLOOD PRESSURE STATUS	
	Current High Blood Pressure[1]	No High Blood Pressure
Total[2]	18.2	81.8
Age		
18-24	3.0	97.0
25-34	4.5	95.5
35-44	16.5	83.5
45-54	24.7	75.3
55-64	31.2	68.8
65 and Over	46.6	53.4
Sex		
Male	18.4	81.6
Female	18.1	81.9
Race		
White	17.7	82.3
Black	22.8	77.2
Education		
Less than H.S.	28.8	71.2
H.S. Graduate	18.3	81.7
Some College	16.6	83.4
College Graduate	11.4	88.6
Income		
Less than $10,000	24.7	75.3
$10,000 - $19,999	22.5	77.5
$20,000 - $35,000	14.4	85.6
Greater than $35,000	14.5	85.5

[1]Respondents who reported that they have been told more than once that their blood pressure is high, or are on medication to reduce blood pressure, or report their blood pressure is still high. This is the definition employed by the National Heart, Lung, and Blood Institute.

[2]Includes persons whose education and/or income were unknown or unreported.

of high blood pressure have changed from ≥160/95 to ≥140/90 in the last few years,[9] which probably increased the proportion of the population that meet the criteria for HBP.

Implications for Health Policy

Despite the advances in risk identification, diagnosis, and treatment, control of high blood pressure continues to present national challenges. These challenges are led by the elusiveness of controlling blood pressure, especially in the male population, and the disproportionate prevalence in the elderly and among black Americans. Questions remain about the reason for earlier development of health complications in black males, and the etiology of hypertension in general.

The Surgeon General's stated goal for 1990 indicates that at least 60% of the population having high blood pressure should have attained long term control.[10] National results from 1980 report that 34% of hypertensives have their blood pressure controlled at levels less than 160/95 and only 11% have achieved blood pressure control under 140/90, the new, lower criteria.[4] The "proposed Year 2000 Objectives" have reassessed this challenge and are currently projecting a goal of 50% of hypertensives achieving blood pressure control for two or more years by the year 2000.[11]

The challenge to Michigan health professionals and citizens is three-fold. First, as a public policy it is important to concentrate limited blood pressure control resources to underserved, high-risk groups, to emphasize innovative control strategies, and to develop tailored approaches to reach black hypertensives. Secondly, all blood pressure screening efforts should be combined with other relevant risk factor assessment, referral, and follow-up services. Lastly, since data show that virtually all residents see a health professional yearly, we must capitalize on all health visit opportunities to accurately assess, advise, and appropriately treat all individuals for elevated blood pressure.

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High Blood Cholesterol

High blood cholesterol* increases the risk of developing coronary heart disease (CHD**), the number one killer of Americans. The development of this disease occurs silently, over decades. Studies show that as blood cholesterol level increases, so too does the risk of CHD.[1,2] Furthermore, a 1% reduction of elevated cholesterol has been demonstrated to result in a 2% reduction of coronary heart disease risk.[3] The Cholesterol Lowering Atherosclerosis Study (CLAS) demonstrated that the progression of atherosclerosis can be reversed.[4] Dietary interventions have achieved reduction in blood cholesterol levels of 10%.[5]

Based on epidemiologic, genetic, animal, and experimental evidence, in 1985 the National Cholesterol Education Program (NCEP) began its task of urging health organizations to work cooperatively to assist in lowering the morbidity and mortality due to CHD by reducing the prevalence of elevated blood cholesterol in this country. Since that time, the NCEP has been active in developing and disseminating policy statements regarding cholesterol measurement, diagnosis, referral and follow-up algorithms, patient education, and behavior modification. As a result, significant gains have been made in cholesterol awareness and research.

NATIONAL AND OTHER ESTIMATES

From NHANES II data, it is estimated that 60 million American adults have high blood cholesterol levels of 240 mg/dL or above.

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*High blood cholesterol is defined as total blood cholesterol ≥ 240 mg/dL. In some cases the term may also refer to "high risk groups" such as those with coronary heart disease risk factors.

**CHD is defined as definite prior myocardial infarction or definite myocardial ischemia, such as angina pectoris.

borderline-high risk, or 200-239 mg/dL. All of those with high cholesterol levels and those with borderline-high risk who also have CHD or two or more risk factors for CHD* (about 14%) require further testing, such as lipoprotein analysis. Thirty-six percent will be at a high enough risk for CHD to justify dietary and/or pharmacologic intervention.[6]

The Cholesterol Awareness Project (CAP) reported positive change in the public's knowledge and awareness about cholesterol and associated health behaviors between 1983 and 1986. In 1983, only 35% of the adult population had had their blood cholesterol checked; by 1986, this proportion rose to 46%. In 1983, about 3% of the respondents knew their own cholesterol level compared to 7% in 1986. In 1983, about 6% recalled being told by a physician that their blood cholesterol was high compared with 8% in 1986. Positive behavior change is demonstrated in this three year comparative survey: in 1983, only 13% tried a change in diet in order to lower their cholesterol, compared to 22% in 1986.[7]

Questions concerning cholesterol awareness were included in a telephone survey conducted in 33 states in 1987 by the Behavioral Risk Factor Surveillance System. Results showed a range of 29-57% (median 47%) of respondents having had their cholesterol checked. The proportion of respondents who reported being told their cholesterol level ranged from 3% to 29% (median 19%). Only 1-9% of the respondents actually knew their cholesterol level (median 6%).[8]

CURRENT FINDINGS

Responses to the question, "Have you ever had your blood cholesterol checked?" are shown in Table 14. Fifty-eight percent of the respondents said they have had their cholesterol checked.

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*CHD risk factors include being male, having a family history of premature CHD, cigarette smoking, hypertension, low HDL, diabetes mellitus, CVD or PVD history, and severe obesity (≥ 30% overweight).

TABLE 14

Cholesterol Testing, by Demographic Characteristics,
Michigan Adults, 1988
(in percent)

Demographic Characteristics	CHOLESTEROL TESTING		
	Ever Had Cholesterol Checked[1]	High Cholesterol[2]	Advised to Reduce Cholesterol[3]
Total[4]	57.9	26.9	18.2
Age			
18-24	29.8	2.6	-[5]
25-34	40.1	18.6	10.1
35-44	57.3	26.1	16.7
45-54	79.8	33.7	22.1
55-64	78.5	36.0	23.2
65 and Over	82.6	30.4	26.5
Sex			
Male	56.8	29.7	18.7
Female	59.0	24.4	17.7
Race			
White	58.2	27.8	18.4
Black	55.3	22.9	18.2
Education			
Less than H.S.	65.2	33.1	25.7
H.S. Graduate	52.5	28.2	21.5
Some College	55.1	23.4	12.9
College Graduate	66.8	24.7	13.7
Income			
Less than $10,000	62.7	30.7	25.9
$10,000 - $19,999	52.3	23.1	15.9
$20,000 - $35,000	53.8	24.4	15.0
Greater than $35,000	64.2	29.0	19.9

[1]Responded "yes" to the question: "Have you ever had your blood cholesterol checked?"

[2]Responded "yes" to the question: "Have you ever been told by a doctor or other health professional that your blood cholesterol is high?" Only those who have had a blood cholesterol test are included.

[3]Responded "yes" to the question: "Are you now under the advice of a doctor to reduce your blood cholesterol or blood fat level?" Only those who have had a blood cholesterol test are included.

[4]Includes persons whose education and/or income were unknown or unreported.

[5]This was not reported by anyone in this category in the sample.

Michigan is well above the median rate (47%) reported for 1987 national BRFS data.[8] Having had one's cholesterol checked is more common among older aged residents compared to 18-24 year olds, and those with higher education and higher income are more likely to have had it checked. The majority of the respondents had their cholesterol checked within the last 12 months (80%). Of those who have had their cholesterol checked, 27% stated they have been told by a doctor or other health professional that their blood cholesterol is high. This is consistent with national estimates of prevalence of high blood cholesterol. Of those respondents who ever had their blood cholesterol checked, 18% were advised to reduce their cholesterol level. This response can be compared to results from the Cholesterol Awareness Project, where 22% reported attempting to make a diet change to lower their blood cholesterol level.

COMMENT

Significant progress has been achieved during the initial three years of the National Cholesterol Education Program. The program has provided impetus for public screening which has resulted in increased identification of those at risk. Public understanding of the nature of cholesterol, its important relationship to health, and methods of cholesterol control has improved.[7] New strategies for treating elevated cholesterol are also being developed.

A challenge which is currently being addressed is the assurance of safe, quality, effective cholesterol screening programs. The Cardiovascular Disease Committee of the Chronic Disease Advisory Committee has developed recommendations* for "Public Cholesterol Screening in Michigan."[9]

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*These recommendations are available for public comment until December 1990, at which time they will be revised and finalized.

Public education about cholesterol and dietary interventions should be emphasized. A key education strategy should be educating children about "heart healthy" eating and the importance of developing healthy lifestyles if the devastating consequences of atherosclerosis are to be avoided.[10]

The proposed Year 2000 Objectives for the Nation have goals related to blood cholesterol, including the following: to increase to 90% the proportion of people who have had their blood cholesterol checked within the past five years, to increase to 75% the proportion of people who can report their blood cholesterol level, and to increase to 60% the proportion of people with high blood cholesterol who have been told that their blood cholesterol level is high. Other goals are to reduce the prevalence of high blood cholesterol levels (240 mg/dL or greater) to no more than 20% and to reduce the mean blood cholesterol level to 200 mg/dL. To meet these objectives, collaborative efforts of the public and private sectors are required. Well-planned, targeted programs utilizing expertise from many disciplines will be needed to meet these challenges in the face of shrinking resources. Innovative strategies for delivering services and an emphasis on efficacy must guide policy development.

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[10]Margolis LH, Sparrow AW, Swanson GM. Growing Into Healthy Adults: Pediatric Antecedents of Adult Disease. Michigan Department of Public Health, Lansing MI, 1989.

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TABLE A-1

95% Confidence Intervals for Estimates from the
1988 Michigan Behavioral Risk Factor Survey,
in Percents, by Age Group

Estimate (in %)	All Ages (+/-)	18-24 Years (+/-)	25-34 Years (+/-)	35-44 Years (+/-)	45-54 Years (+/-)	55-64 Years (+/-)	65 + Years (+/-)
1 or 99	.58	1.36	1.22	1.36	1.51	1.66	1.61
2 or 98	.82	1.91	1.72	1.92	2.12	2.34	2.27
3 or 97	1.00	2.33	2.10	2.34	2.58	2.85	2.76
4 or 96	1.15	2.68	2.41	2.69	2.97	3.27	3.18
5 or 95	1.28	2.98	2.68	2.99	3.30	3.64	3.53
6 or 94	1.39	3.25	2.92	3.26	3.60	3.96	3.85
7 or 93	1.50	3.49	3.14	3.50	3.87	4.26	4.14
8 or 92	1.59	3.71	3.34	3.72	4.11	4.53	4.40
9 or 91	1.68	3.91	3.52	3.93	4.34	4.78	4.64
10 or 90	1.76	4.10	3.70	4.12	4.55	5.01	4.86
11 or 89	1.84	4.28	3.85	4.30	4.75	5.22	5.07
12 or 88	1.91	4.44	4.00	4.46	4.93	5.43	5.27
13 or 87	1.97	4.60	4.14	4.62	5.10	5.62	5.45
14 or 86	2.04	4.74	4.27	4.76	5.26	5.79	5.63
15 or 85	2.10	4.88	4.40	4.90	5.42	5.96	5.79
16 or 84	2.15	5.01	4.52	5.03	5.56	6.12	5.95
17 or 83	2.20	5.14	4.63	5.16	5.70	6.27	6.09
18 or 82	2.26	5.25	4.73	5.28	5.83	6.42	6.23
19 or 81	2.30	5.37	4.83	5.39	5.95	6.55	6.36
20 or 80	2.35	5.47	4.93	5.49	6.07	6.68	6.49
21 or 79	2.39	5.57	5.02	5.59	6.18	6.80	6.61
22 or 78	2.43	5.67	5.10	5.69	6.28	6.92	6.72
23 or 77	2.47	5.76	5.19	5.78	6.38	7.03	6.83
24 or 76	2.51	5.84	5.26	5.87	6.48	7.13	6.93
25 or 75	2.54	5.92	5.34	5.95	6.57	7.23	7.02
26 or 74	2.58	6.00	5.41	6.02	6.65	7.33	7.11
27 or 73	2.61	6.07	5.47	6.10	6.74	7.42	7.20
28 or 72	2.64	6.14	5.53	6.17	6.81	7.50	7.28
29 or 71	2.66	6.21	5.59	6.23	6.88	7.58	7.36
30 or 70	2.69	6.27	5.65	6.29	6.95	7.65	7.43
31 or 69	2.72	6.33	5.70	6.35	7.02	7.73	7.50
32 or 68	2.74	6.38	5.75	6.41	7.08	7.79	7.57
33 or 67	2.76	6.43	5.79	6.46	7.13	7.85	7.63
34 or 66	2.78	6.48	5.84	6.51	7.19	7.91	7.68
35 or 65	2.80	6.52	5.88	6.55	7.24	7.97	7.74
36 or 64	2.82	6.57	5.92	6.59	7.28	8.02	7.79
37 or 63	2.84	6.60	5.95	6.63	7.32	8.07	7.83
38 or 62	2.85	6.64	5.98	6.67	7.36	8.11	7.87
39 or 61	2.86	6.67	6.01	6.70	7.40	8.15	7.91
40 or 60	2.88	6.70	6.04	6.73	7.43	8.18	7.95
41 or 59	2.89	6.73	6.06	6.76	7.46	8.22	7.98
42 or 58	2.90	6.75	6.08	6.78	7.49	8.24	8.01
43 or 57	2.91	6.77	6.10	6.80	7.51	8.27	8.03
44 or 56	2.92	6.79	6.12	6.82	7.53	8.29	8.05
45 or 55	2.92	6.81	6.13	6.83	7.55	8.31	8.07
46 or 54	2.93	6.82	6.14	6.85	7.56	8.33	8.08
47 or 53	2.93	6.83	6.15	6.86	7.57	8.34	8.10
48 or 52	2.93	6.83	6.16	6.86	7.58	8.35	8.10
49 or 51	2.94	6.84	6.16	6.87	7.58	8.35	8.11
50	2.94	6.84	6.16	6.87	7.59	8.35	8.11

TABLE A-2

95% Confidence Intervals for Estimates from the 1988 Michigan Behavioral Risk Factor Survey, in Percents, by Sex

Estimate (in %)	Male (+/-)	Female (+/-)
1 or 99	.84	.81
2 or 98	1.18	1.14
3 or 97	1.44	1.39
4 or 96	1.65	1.60
5 or 95	1.84	1.78
6 or 94	2.01	1.94
7 or 93	2.16	2.08
8 or 92	2.29	2.21
9 or 91	2.42	2.34
10 or 90	2.54	2.45
11 or 89	2.64	2.55
12 or 88	2.75	2.65
13 or 87	2.84	2.75
14 or 86	2.93	2.83
15 or 85	3.02	2.92
16 or 84	3.10	2.99
17 or 83	3.18	3.07
18 or 82	3.25	3.14
19 or 81	3.32	3.20
20 or 80	3.38	3.27
21 or 79	3.44	3.33
22 or 78	3.50	3.38
23 or 77	3.56	3.44
24 or 76	3.61	3.49
25 or 75	3.66	3.54
26 or 74	3.71	3.58
27 or 73	3.75	3.63
28 or 72	3.80	3.67
29 or 71	3.84	3.71
30 or 70	3.88	3.74
31 or 69	3.91	3.78
32 or 68	3.94	3.81
33 or 67	3.98	3.84
34 or 66	4.01	3.87
35 or 65	4.03	3.90
36 or 64	4.06	3.92
37 or 63	4.08	3.94
38 or 62	4.10	3.97
39 or 61	4.12	3.98
40 or 60	4.14	4.00
41 or 59	4.16	4.02
42 or 58	4.17	4.03
43 or 57	4.19	4.04
44 or 56	4.20	4.06
45 or 55	4.21	4.06
46 or 54	4.22	4.07
47 or 53	4.22	4.08
48 or 52	4.23	4.08
49 or 51	4.23	4.08
50	4.23	4.08

TABLE A-3

95% Confidence Intervals for Estimates from the 1988 Michigan Behavioral Risk Factor Survey, in Percents, by Race

Estimate (in %)	White (+/-)	Black (+/-)
1 or 99	.62	1.68
2 or 98	.88	2.37
3 or 97	1.07	2.89
4 or 96	1.23	3.32
5 or 95	1.37	3.69
6 or 94	1.49	4.03
7 or 93	1.61	4.33
8 or 92	1.71	4.60
9 or 91	1.80	4.85
10 or 90	1.89	5.09
11 or 89	1.97	5.31
12 or 88	2.05	5.51
13 or 87	2.12	5.70
14 or 86	2.19	5.88
15 or 85	2.25	6.06
16 or 84	2.31	6.22
17 or 83	2.37	6.37
18 or 82	2.42	6.52
19 or 81	2.47	6.65
20 or 80	2.52	6.78
21 or 79	2.57	6.91
22 or 78	2.61	7.03
23 or 77	2.65	7.14
24 or 76	2.69	7.24
25 or 75	2.73	7.35
26 or 74	2.76	7.44
27 or 73	2.80	7.53
28 or 72	2.83	7.62
29 or 71	2.86	7.70
30 or 70	2.89	7.77
31 or 69	2.92	7.85
32 or 68	2.94	7.91
33 or 67	2.96	7.98
34 or 66	2.99	8.04
35 or 65	3.01	8.09
36 or 64	3.03	8.14
37 or 63	3.04	8.19
38 or 62	3.06	8.23
39 or 61	3.08	8.27
40 or 60	3.09	8.31
41 or 59	3.10	8.34
42 or 58	3.11	8.37
43 or 57	3.12	8.40
44 or 56	3.13	8.42
45 or 55	3.14	8.44
46 or 54	3.14	8.45
47 or 53	3.15	8.47
48 or 52	3.15	8.48
49 or 51	3.15	8.48
50	3.15	8.48

TABLE A-4

95% Confidence Intervals for Estimates from the 1988 Michigan Behavioral Risk Factor Survey, in Percents, by Education

Estimate (in %)	Less Than High School (+/-)	High School Graduate (+/-)	Some College (+/-)	College Graduate (+/-)
1 or 99	1.47	.96	1.09	1.36
2 or 98	2.06	1.35	1.54	1.92
3 or 97	2.52	1.64	1.88	2.34
4 or 96	2.89	1.89	2.16	2.69
5 or 95	3.22	2.10	2.40	2.99
6 or 94	3.51	2.29	2.61	3.26
7 or 93	3.77	2.46	2.81	3.50
8 or 92	4.01	2.62	2.99	3.72
9 or 91	4.23	2.76	3.15	3.93
10 or 90	4.43	2.89	3.30	4.12
11 or 89	4.62	3.02	3.45	4.30
12 or 88	4.80	3.13	3.58	4.46
13 or 87	4.97	3.24	3.70	4.62
14 or 86	5.12	3.35	3.82	4.76
15 or 85	5.27	3.44	3.93	4.90
16 or 84	5.41	3.54	4.04	5.03
17 or 83	5.55	3.62	4.14	5.16
18 or 82	5.67	3.71	4.23	5.28
19 or 81	5.79	3.78	4.32	5.39
20 or 80	5.91	3.86	4.41	5.49
21 or 79	6.02	3.93	4.49	5.59
22 or 78	6.12	4.00	4.56	5.69
23 or 77	6.22	4.06	4.64	5.78
24 or 76	6.31	4.12	4.71	5.87
25 or 75	6.40	4.18	4.77	5.95
26 or 74	6.48	4.23	4.83	6.02
27 or 73	6.56	4.28	4.89	6.10
28 or 72	6.63	4.33	4.95	6.17
29 or 71	6.70	4.38	5.00	6.23
30 or 70	6.77	4.42	5.05	6.29
31 or 69	6.83	4.46	5.10	6.35
32 or 68	6.89	4.50	5.14	6.41
33 or 67	6.95	4.54	5.18	6.46
34 or 66	7.00	4.57	5.22	6.51
35 or 65	7.05	4.60	5.26	6.55
36 or 64	7.09	4.63	5.29	6.59
37 or 63	7.13	4.66	5.32	6.63
38 or 62	7.17	4.68	5.35	6.67
39 or 61	7.20	4.71	5.37	6.70
40 or 60	7.24	4.73	5.40	6.73
41 or 59	7.26	4.75	5.42	6.76
42 or 58	7.29	4.76	5.44	6.78
43 or 57	7.31	4.78	5.46	6.80
44 or 56	7.33	4.79	5.47	6.82
45 or 55	7.35	4.80	5.48	6.83
46 or 54	7.36	4.81	5.49	6.85
47 or 53	7.37	4.82	5.50	6.86
48 or 52	7.38	4.82	5.50	6.86
49 or 51	7.38	4.82	5.51	6.87
50	7.39	4.83	5.51	6.87

TABLE A-5

95% Confidence Intervals for Estimates from the 1988 Michigan Behavioral Risk Factor Survey, in Percents, by Income Level

Estimate (in %)	Less than $10,000 (+/-)	$10,000 - $19,999 (+/-)	$20,000 - $35,000 (+/-)	More Than $35,000 (+/-)
1 or 99	1.73	1.26	1.10	1.04
2 or 98	2.44	1.77	1.56	1.46
3 or 97	2.98	2.16	1.90	1.78
4 or 96	3.42	2.48	2.18	2.05
5 or 95	3.80	2.76	2.42	2.28
6 or 94	4.14	3.00	2.64	2.48
7 or 93	4.45	3.23	2.84	2.67
8 or 92	4.74	3.43	3.02	2.84
9 or 91	5.00	3.62	3.19	2.99
10 or 90	5.24	3.80	3.34	3.14
11 or 89	5.46	3.96	3.48	3.27
12 or 88	5.67	4.11	3.62	3.40
13 or 87	5.87	4.26	3.74	3.52
14 or 86	6.06	4.39	3.86	3.63
15 or 85	6.23	4.52	3.98	3.74
16 or 84	6.40	4.64	4.08	3.84
17 or 83	6.56	4.76	4.18	3.93
18 or 82	6.71	4.86	4.28	4.02
19 or 81	6.85	4.97	4.37	4.10
20 or 80	6.98	5.06	4.45	4.19
21 or 79	7.11	5.16	4.54	4.26
22 or 78	7.23	5.25	4.61	4.33
23 or 77	7.35	5.33	4.69	4.40
24 or 76	7.46	5.41	4.76	4.47
25 or 75	7.56	5.48	4.82	4.53
26 or 74	7.66	5.55	4.88	4.59
27 or 73	7.75	5.62	4.94	4.65
28 or 72	7.84	5.69	5.00	4.70
29 or 71	7.92	5.75	5.05	4.75
30 or 70	8.00	5.80	5.10	4.80
31 or 69	8.08	5.86	5.15	4.84
32 or 68	8.15	5.91	5.19	4.88
33 or 67	8.21	5.95	5.24	4.92
34 or 66	8.27	6.00	5.28	4.96
35 or 65	8.33	6.04	5.31	4.99
36 or 64	8.38	6.08	5.35	5.02
37 or 63	8.43	6.11	5.38	5.05
38 or 62	8.48	6.15	5.41	5.08
39 or 61	8.52	6.18	5.43	5.10
40 or 60	8.55	6.20	5.46	5.13
41 or 59	8.59	6.23	5.48	5.15
42 or 58	8.62	6.25	5.50	5.17
43 or 57	8.65	6.27	5.51	5.18
44 or 56	8.67	6.29	5.53	5.20
45 or 55	8.69	6.30	5.54	5.21
46 or 54	8.70	6.31	5.55	5.22
47 or 53	8.72	6.32	5.56	5.22
48 or 52	8.72	6.33	5.56	5.23
49 or 51	8.73	6.33	5.57	5.23
50	8.73	6.33	5.57	5.23